

have been mounted with Canada balsam on card, and to clean them so as to really determine the form of the coxal fossettes would perhaps be only unsatisfactory. It is a distinct-looking species, and when found in the same or neighbouring islands ought to be recognized.

[SCYMNUS PHLÆUS.]

Scymnus phlæus, Muls. Spec. Col. Trim. sécur. p. 983; Crotch, Rev. Cocc. p. 271.

Hab. West Indies (*Chevrolat*).

The type of this is not in Crotch's collection; a single example representing it is marked "*phlæus?*," and is from Caracas, but is valueless, being in miserable condition, and does not agree with Mulsant's description.

EXPLANATION OF PLATE XXVII. FIGS. 6, 11, & 12.

Figs. 6, 6 *a.* *Cryptognatha melanura*, p. 341.

11, 11 *a.* *Hapalips grouvellei*, ♂, p. 334.

12. *Hapalips grouvellei*, ♀.

4. Remarks on the Affinities of *Palæospondylus gunni*. In reply to Dr. R. H. Traquair. By Dr. BASHFORD DEAN¹.

[Received March 12, 1898.]

Whether *Palæospondylus* is to be accepted by zoologists as a Devonian hag-fish is a question of singular interest. For all views as to the kinships and descent of the Marsipobranchs, the outcome of widely-spread morphological and ontogenetic studies, must stand the test of this historic evidence. Thus, if *Palæospondylus* becomes the landmark in the descent of Marsipobranchs, this line must obviously have been both as ancient and as independent as those of other fish-like vertebrates.

But the evidence that *Palæospondylus* is a Cyclostome has yet to be satisfactorily furnished. Many of its accurately determined structures are distinctly unlike those of myxinoids or petromyzonts; while those features which appear at first sight cyclostomian occur also in other fish-like forms, and in the mouth, nasal region especially, may even in part be due to the imperfect preservation of the fossil. These objections, not unduly critical in view of the importance of the subject, become all the more formidable in view of the fact that paired fins may have been present.

The latter condition was suggested by the present writer, on the evidence of a specimen of *Palæospondylus* in the geological museum of Columbia University, presenting a series of transverse ray-shaped markings, which were interpreted as probably the basal supports of paired fins. The brief paper² in which the specimen

¹ Communicated by A. SMITH WOODWARD, F.Z.S. (See P. Z. S. 1897, p. 314.)

² Trans. New York Acad. Sci. vol. xv. 1896, pp. 101-104, pl. v.

was described tabulated also the reasons for and against the alliance of *Palæospondylus* with the Cyclostomes, maintaining finally that the sole character directly favourable to this alliance was the ring-shaped opening at the head terminal, and that even this evidence was far from convincing.

Some of these objections, however, were shortly answered by Dr. Traquair¹, the describer of the fossil and the vigorous supporter of its supposed cyclostomian affinities. The debatable specimen had been sent to him at Edinburgh; but it had not convinced him that the radial-shaped markings were other than petrological. He criticises, furthermore, several points in terminology, and, although he does not consider the balance of evidence as being against the marsipobranchian features, feels himself justified in concluding that the question of the affinities of *Palæospondylus* is left where it was after he had written his last paper on the subject: that is that, according to his interpretation of the fossil, there seems no escape from the conclusion that it must be classed as a marsipobranch.

The purpose of the present paper is to reply to the criticism of Dr. Traquair and to emphasize the *non sequitur* of his general conclusions. The latter purpose is the more interesting, for to retain *Palæospondylus* even provisionally in the position of a Devonian cyclostome will certainly, on such slender evidence, prove of little value, if not of actual harm, to phylogenetic studies.

The answer to the criticism of Dr. Traquair may be arranged:—

(I.) As to the “petrological” nature of the supposed fin-supports, and (II.) as to the matters of terminology.

(I.) The evidence that the markings first described by me are not petrological has in part been furnished me most generously by Dr. Traquair himself; for during a recent visit to Edinburgh he permitted me to examine the material of *Palæospondylus* both in the Museum of Science and Art and in his private cabinet; and a specimen of the latter he has even loaned to me for further study—kindnesses which I acknowledge gratefully. Among these specimens were two or three which showed distinct traces of the questionable markings as first described, in the same position, of the same general shape and size. That these markings re-occur so similarly seems to me conclusive evidence that they must be interpreted as *structures* of the fossil. But it will be objected that these markings have retained no organic matter, “mere shadows,” as Traquair expresses it, due to favourable illumination. Be this granted in every case but the first, where I am not satisfied that all traces of tissue have been weathered out: yet this objection is by no means fatal. For in numerous specimens of *Palæospondylus* the markings of the tips of the caudal fin-rays are equally lacking in organic matter, “mere shadows,” best to be seen with an oblique light,—yet no one will doubt that these ray-shaped shadows represent structures of the fossil. The writer has in mind entire specimens of *Palæospondylus* in Mr. Kinnear’s collection which have been intentionally “weathered out,” in which nothing remains but the “shadows” of head, vertebræ, and tail!

¹ Proc. Zool. Soc. 1897, pp. 314-317.

Finally, that the regular grain of the stone has produced the questionable markings, as Dr. Traquair maintains, has been pronounced untenable by those petrologists to whom I have shown specimens. The parallel striature he refers to, so common in many matrices, is finer, smoother, more regular, continuous, much fainter, not to be confused with the blunt-ended markings noted in the foregoing specimens. In view of the evidence of additional fossils one must, I believe, regard the markings as representing structures—whatever be accepted as their ultimate homology. Dr. Traquair denied before the British Association (1896) that my fossil had any value, prior to his examination of it, on the ground that in his many specimens there were no traces of the markings. This objection is now obviously invalid, since in his own collection have been found traces of them. Indeed there is reason why among several hundred fossils there might not appear prominent remains of structures as frail as the questionable fin-supports; for the specimens of *Palæospondylus* are, as a rule, poorly preserved. So far as I know, in all the materials extant there are very few specimens—a dozen or thereabouts—which deserve to be pronounced really good.

(II.) Dr. Traquair's criticism of my terminology is included under the following heads:—(a) the use of the term “oral” for what he believes to be “nasal”; (b) reference to the “diphycercal (or perhaps heterocercal)” caudal fin; and (c) supposed confusion of terms “radial” and “basal” fin-supports.

(a) The first of these is the important one. That the anterior “median cirrated opening” of *Palæospondylus* was described by Dr. Traquair as entirely nasal, altogether unconnected with the mouth, I have certainly been loth to believe. He refers to part of it in his second paper¹ as “the upper margin of a suctorial mouth,” and later as “presumably nasal,”² and I have referred to it, partly on this account, as equivalent to the mouth-region of a myxinoïd³. He nowhere states that it is independent from the mouth, and, although his comparison is with Marsipobranchs in general, he repeatedly refers to *Myxine*⁴, in which the barbel-bearing ring of fibro-cartilage encircles the openings of both mouth and nose. That the “cirrated” ring should be regarded as nasal *only* seemed most unintelligible, for it was not probable that Dr. Traquair would wish to ally *Palæospondylus* to the Marsipobranchs by a character

¹ Proc. Roy. Phys. Soc. Edinb. 1892-93, xii. p. 90.

² *L. c.* p. 318, and Ann. Scot. Nat. Hist. 1894, April, p. 98.

³ He twice refers to the greater length of the lateral “barbels” and their origin “inside the margin of the ring, instead of from its rim like the others” (*L. c.* p. 96), a condition which further suggests to the reader the division of the opening into ventral (mouth) and dorsal (nasal) halves.

⁴ *E. g.* (Proc. Roy. Phys. Soc. Edinb. xii. p. 319) “... in the recent Marsipobranchs, two kinds of cartilage enter into the formation of the cranio-facial apparatus, of which one is considerably harder and more solid than the other. In *Myxine* the hard cartilage prevails in the cranium, while the soft variety enters largely into the structure of the hyo-lingual parts. A similar condition may have existed in *Palæospondylus*....”

absolutely unknown in the entire craniote phylum,—a terminal monorhinal ring bearing barbel-like structures. This would entail the development of a new theory of the vertebrate head, the *cirrhorhinal*, as opposed to the *cirrhostomial* theory of Pollard. That this departure from our old-fashioned ideas of marsipobranch morphology

Characters of *Palæospondylus* with reference to Marsipobranchs.

<i>Evidence</i>	<i>Favourable</i>	<i>Unfavourable</i>
Oral cirri ...	Suggest somewhat the barbels of the nasomouth region of myxinoïd	Resemble even as much in arrangement and greater number the buccal cirri of <i>Amphioxus</i> . Dr. Traquair's evidence of cirrorhiny (protochordate?). On the other hand, similar mouth-surrounding tentacles evolved independently in many groups of fishes—siluroids, sharks, forms like <i>Pogonias</i> , <i>Hemitripterus</i> . A possibility, further, that the "cirri" may turn out to be remnants of cranial or facial structures of an entirely different nature.
Jaw parts ...	Unknown	Unknown. Possibility that the ventral rim of the "nasal ring" may prove to be the remains of Meekelian cartilage. (<i>Vide</i> Ann. Scot. Nat. Hist. 1894, pl. iii. figs. 1, 2).
Cranium		Utterly non-marsipobranchian. Massive cranium, over twice as large proportionately as in the lamprey. Huge auditory (?) capsules.
Vertebral column.		Utterly non-marsipobranchian. Highly evolved. Massive centra, prominent neural arches.
Paired fins		Fatal evidence against marsipobranch affinities, if the ray-shaped markings are admitted to be the basalia of paired fins. Their presence is alone sufficient, <i>ceteris paribus</i> , to cause <i>Palæospondylus</i> to be removed from its provisional position among the Cyclostomes. Also the "post-occipital plates" possibly represent a pectoral arch.
Caudal fin ...	Essentially marsipobranchian, especially its dichotomous rays.	Its condition also common, as diphycercy (and gephyrocercy), in other groups of fishes—sharks, lung-fishes, teleostomes.

was, however, actually intended becomes evident from his remarks on my earlier paper. And I sincerely apologize for having misunderstood his meaning. For now it appears that he interprets the ring and its cirri as "*cranial*" structures, and they must therefore be entirely unlike the myxinoïd ring, which is clearly

facial. Thus he himself rejects the most significant point of comparison of *Palæospondylus* with cylostome.

(b) To the second criticism, that in regard to the possible heterocercy of *Palæospondylus*, there is needed but a brief explanation. For in the first place Dr. Traquair, so far as I am aware, does not use either term, diphycercy or heterocercy. His figures, however, indicate clearly the diphycercal condition. I now remember, however, that I qualified it in parentheses as "perhaps heterocercal," owing to the following sentence in Dr. Traquair's third paper¹:—"A specimen which I obtained last autumn . . . shows that these rods or spines (of the tail-fin) were considerably longer than they had been represented in any of my figures, and consequently that the fin was so much deeper"²:—does this mean heterocercal?

(c) That Dr. Traquair has mistaken my use of the terms *radial* and *basal* fin-supports is possibly due to a hasty reading of my paper. The questionable markings had been described as lying within the line of the body-wall, therefore obviously interpretable as basals. They are, however, of the narrow rod-shaped form characteristic of radial fin-supports, and have, therefore, been termed from their shape "radial-like."

To return next to the question of the affinities of *Palæospondylus*. The structural evidence it presents in likeness and unlikeness to the Marsipobranchs has already been tabulated, and may be repeated with additions (see p. 346).

From this comparison I am led to believe that *Palæospondylus* should not be given a place—even a provisional one—among the Marsipobranchs, leaving out of question the possibility of its having paired fins³. The weight of evidence certainly falls on the unfavourable side. But what position can be assigned to so problematical a vertebrate? Dr. Traquair agrees that "if *Palæospondylus* be not a Marsipobranch, it is quite impossible to refer it to any other existing group of Vertebrata." Until at least a more definite knowledge of its structures shall warrant the change, systematists may be willing to accept it as the representative of the new sub-class (or class?) *Cyclia*, constituted for it by Professor Gill⁴.

Columbia University,
Feb. 7, 1898.

¹ Proc. Roy. Phys. Soc. Edinb. xii. p. 316.

² The italics and parentheses are mine.

³ If the markings be the basalalia of paired fins, the latter would certainly be of a ptychopterygial form. The markings cannot well be neural and hæmal spines, for reasons already given; nor ribs, from their size or shape; nor casts of muscle-plates, first from their shape, and second from their position, for in the neighbourhood of the gills muscle-plates, as experience has shown, are least likely to be preserved.

⁴ 'Science,' July 3, 1896.

May 3, 1898.

Prof. G. B. HOWES, F.R.S., F.Z.S., in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of April 1898:—

The total number of registered additions to the Society's Menagerie during the month of April was 165, of which 101 were by presentation, 43 by purchase, 3 were received on deposit, 17 were born in the Menagerie, and 1 was received in exchange. The total number of departures during the same period, by death and removals, was 87.

Among the additions attention may be specially called to two birds forwarded by Dr. Goeldi, C.M.Z.S., from Pará, and presented to the Society's Collection. These are:—

1. A nearly white fowl, stated to be a hybrid between a male Guinea-fowl and a domestic hen, from Ceará, Brazil, where it is said that such crosses are often bred and are called Tahý. This bird looks, at first, so much like a common hen that one would be inclined to doubt its alleged parentage until one hears its voice, which is most unmistakably that of a Guinea-fowl. On close examination it also shows a slight coronal helmet and indications of lappets at the gape.

2. A male Curassow (*Crax pinima*) from the upper valley of the Rio Grajahu in the State of Maranhão.

Dr. Goeldi writes:—"This bird will interest you, as it has me, because it quite agrees with the males of '*Mutum pinima*' which were brought to me by the Tembé Indians from the upper valley of the Rio Capim, and, according to my opinion, settles the whole question of *Crax pinima* of Natterer being the hitherto unknown male of the females upon which the Nattererian species was established, which species was afterwards united with *Crax sclateri* Gray. This being the case, the Nattererian *Crax pinima* should now be recognized."

A communication was read from the Rev. O. Pickard Cambridge, F.R.S., stating that as he found that his name *Eatonia*, proposed for a new genus of Acaridea in a paper read on December 14th last (see P. Z. S. 1897, p. 939), had been previously employed for a genus of Brachiopoda (see 10th Ann. Report of New York State Cabinet of Nat. Hist. p. 90), he proposed to substitute for it the new name *Eatoniana*.
